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Synthesis of optimal polymeric microgels and their characterization with light scattering

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Abstract

Polymeric microgels were synthesized in by chemically crosslinking hydroxypropylcellulose (HPC) chains with each other in aqueous solutions of sodium hydroxide at temperatures above the low solution critical temperature (LCST) of HPC. In order to create a narrower size distribution of HPC microgels, surfactant (dodecyltrimethylammonium bromide, DTAB) was added. It was found that, LCST of the solution moved from ~40C up to 80C with an increase in DTAB concentration from 0 to 12 g/l. Formed microgels were be characterized by dynamic light scattering (DLS). Microgel solutions synthesized so far resulted in reasonably monodispersed nanoparticles between the sizes of 150-90 nm below the known LCST for HPC, and 90-50 nm above the known LCST for HPC. Surprisingly some of the microgels revealed weak VH signal, indicating their potential geometric anisotropy. Further studies were done in an attempt to explore the effect of synthesis temperature and crosslinker concentration and microgel size, polydispersity, and swelling ratio. It was found that maintaining a pH of 12 for the aqueous sodium hydroxide solvent was critical to ensure reproducibility of synthesis. However, it was also found that the pH of the solvent had no effect on the overall LCST of the HPC in DTAB-free solutions.